

1 487 986

- (21) Application No. 26624/75 (22) Filed 23 June 1975 (19)  
 (31) Convention Application No. 7 501 480 (32) Filed 17 Jan. 1975 in  
 (33) France (FR)  
 (44) Complete Specification published 5 Oct. 1977  
 (51) INT. CL.<sup>2</sup> E02B 3/04  
 (52) Index at acceptance  
 E1H 15



(54) IMPROVEMENTS TO MODULAR ELEMENTS FOR CONSTRUCTING  
 HYDRAULIC AND SUBAQUEOUS STRUCTURES

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 No. 47 80. Piso, Mexico 5, D.F., Mexico,  
 do hereby declare the invention, for which  
 5 I pray that a patent may be granted to me,  
 and the method by which it is to be per-  
 formed, to be particularly described in and  
 by the following statement:—

The present invention relates to modular  
 10 elements for constructing hydraulic and sub-  
 aqueous structures as described in my co-  
 pending British patent application No.  
 44152/74 (Serial No. 1485470). The ex-  
 15 pression "hydraulic" is used to refer to  
 structures which control, direct or channel  
 flowing water.

These elements are formed by a flexible  
 envelope which is provided with valve de-  
 20 vices which enable the element to be filled,  
 at the point where it is to be used, with a  
 solid material (a mixture of sand and  
 cement) which is injected under pressure.

The flexible envelope has the advantage  
 that, when the element is placed in position,  
 25 it is able to adapt to the configuration of  
 the bed and to other elements which are  
 already in position.

However, in certain applications, due to  
 the way in which the flexible envelopes de-  
 30 form when filled under pressure, and in par-  
 ticular when the filling material is a quick-  
 setting cement, the final shape assumed by  
 the elements is not the one best suited for  
 their function in the structure which is  
 35 planned.

The present invention proposes to over-  
 come or minimize this drawback and to give  
 the element the final shape required, with-  
 40 out at the same time losing the advantages  
 which result from the flexibility of the en-  
 velope, and while providing the additional  
 advantage of pre-stressing the filling sub-  
 stance to a certain extent.

Accordingly, the invention consists in a  
 45 modular constructional element comprising  
 a flexible envelope having an inlet valve for  
 admitting a solidifiable fluid substance under  
 pressure, said envelope also being provided  
 with elongated reinforcing members which  
 50 are expandable to create pressure on said

substance until the substance is finally  
 solidified.

In order that the invention may be more  
 clearly understood, reference will now be  
 made to the accompanying drawings which  
 show some embodiments thereof by way of  
 example and in which:—

Figure 1 is a partly cut-away perspective  
 view of a modular constructional element  
 which is provided with reinforcing and pre-  
 60 stressing means arranged between opposing  
 side-walls of its envelope,

Figure 2 is a side-view of a modular  
 constructional element the envelope of  
 which is provided with members for con-  
 65 fining its transversely, and

Figure 3 is a side-view, partly in cross-  
 section, of a modular constructional element  
 provided with internal reinforcing members  
 and with a detachable external fitment for  
 70 protecting these members.

Referring now to the drawings, in Figure  
 1, the element consists of an envelope 1  
 made of a flexible material, which is in-  
 tended to hold cement or some other fluid  
 75 solidifiable filling substance which is rep-  
 resented by the dots 2. This substance is  
 introduced under pressure through an orifice  
 3 which is fitted, as described in the afore-  
 mentioned specification, with a suitable valve.

Elongated reinforcing members 4 are fixed  
 between the opposing walls of the envelope.  
 These members may possibly form an inte-  
 gral part of the envelope if the material is  
 85 such as to allow them to be produced when  
 the envelope is moulded. The length of the  
 members 4 when not under load is less than  
 the corresponding inside dimension of the  
 envelope when in the expanded state, and  
 they are formed from a material having high  
 90 mechanical strength which is capable of  
 sufficient extension to allow the envelope  
 to expand to a certain degree when the fill-  
 ing material is introduced under pressure.  
 The result is that members 4, by virtue of  
 95 their mechanical strength and elasticity  
 characteristics, restrict and modify the way  
 in which the element deforms when filled  
 while increasing its mechanical strength.

Furthermore, a pre-stressing action is 100

